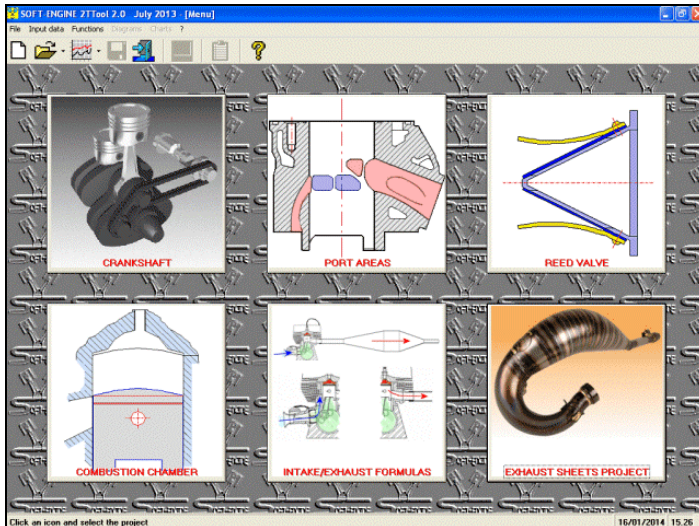


Soft-Engine - Software 2TTool 2.0

Main features

2TTOOL is a **software** by **Soft-Engine** which is very easy to use and includes all you may need for a **2-stroke engine** conception with a special focus on practical issues commonly necessary to engineers, such as:



The main window

- ☞ **area parameters** and ports optimisation;
- ☞ **crank mechanism** : inertial force, combustion, stress (we recommend the: [VYBRO](#) software);
- ☞ **combustion chamber**: **compression ratio**, **squish** and squish velocity;
- ☞ **reed valves**: design and work frequencies;
- ☞ **exhaust length** : basic length calculation;
- ☞ **intake length**: inertial force and pulsing calculation;
- ☞ **cones and cylinders development** (we recommend the [CONS](#) software).

The software is totally re-styled in the graphic aspect and several function are added. Software is compatible with Windows (Xp, Vista, Seven, Eight).

Data input

A main window is used to select the suitable computing model. There are some dialog-windows to input the data. Here some samples:

The 'Crankshaft Data' dialog window is divided into three main sections for data input, a central diagram, and a right-hand control panel.

Engine data input:

| | |
|----------------------|---------|
| Bore [mm]: | 54.0 |
| Stroke [mm]: | 54.0 |
| Con rod length [mm]: | 110.0 |
| Max. RPM [RPM]: | 14000.0 |

Inertial force data input:

| | |
|---------------------------------|-------|
| Complete piston mass [g]: | 100.0 |
| Alternate con-rod mass [g]: | 100.0 |
| Area of stressed section [mm²]: | 100.0 |

Thermodynamic cycle data input:

| | |
|--|------|
| Effective compression ratio: | 9.0 |
| Volumetric efficiency: | 0.78 |
| Air / fuel ratio: | 14.0 |
| Ignition advance B.T.D.C. [°]: | 20.0 |
| Exhaust port opening advance B.B.D.C. [°]: | 40.0 |

The central diagram shows a cross-section of a crankshaft and piston assembly with dimensions labeled: AI (crank arm length), Crs (crank pin radius), and Lb (connecting rod length).

Right-hand control panel:

- KINEMATICS** (selected)
- INERTIAL F.**
- CYCLE**
- Resumptive data** (button)
- OK** (button)
- Close** (button)

At the bottom, it states 'Activates the thermodynamics computing mode' and shows the date '16/01/2014' and time '15.27'.

Crankshaft and thermo dynamics cycle data input window

Reed valves data input

Petals number: Numero luci: Petals material: ☒ Saw ☐ Carbon fiber ☐ Glass fiber

REEDS

Petals width [mm]:

Petals thickness [mm]:

PORT A VIEW

Ports radius [mm]:

Ports width [mm]:

Ports lenght [mm]:

Petals free lenght [mm]:

Reed valve peak half-angle [mm]:

Lift [mm]:

A

Input data, OK to confirm... 16/01/2014 15.27

Reed valve data input window

COMBUSTION CHAMBER PROYECT

Spark-plug internal volume [CC]:

Edge radius [mm]:

Squish head height [mm]:

Chamber radius [mm]:

Piston head radius [mm]:

Squish height [mm]:

Squish diameter [mm]:

Bore [mm]:

Stroke [mm]:

Con rod length [mm]:

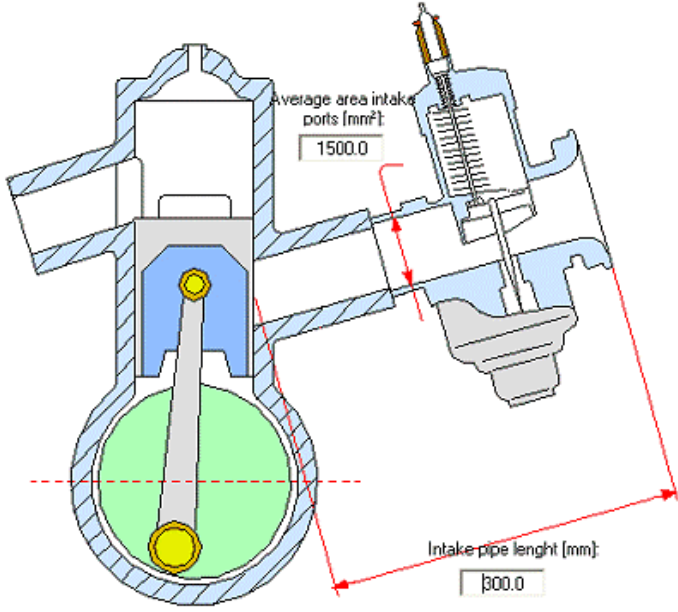
Exhaust phase total period [°]:

Max. RPM [RPM]:

Input data, OK to confirm... 16/01/2014 15.27

Combustion chamber data input window

INTAKE COMPUTING FORMULAS



Average area intake ports (mm²): 1500.0

Intake duration [°]: 150.0

Volume carter pump [CC]: 500.0

Intake pipe lenght (mm): 300.0

Close Resumptive data OK

Input data, OK to confirm... 16/01/2014 15.27

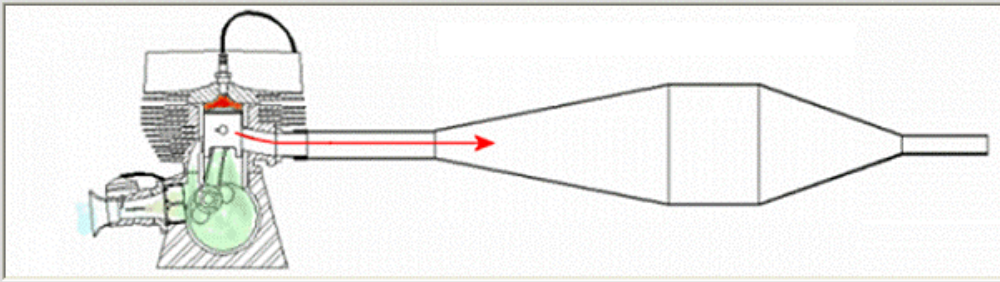
Intake Volumetric efficiency computing data input window

EXHAUST COMPUTING FORMULAS

Exhaust gases temperature [°C]: 620.0

Exhaust phase total period [°]: 180.0

Regime of max. horsepower [RPM]: 14000.0



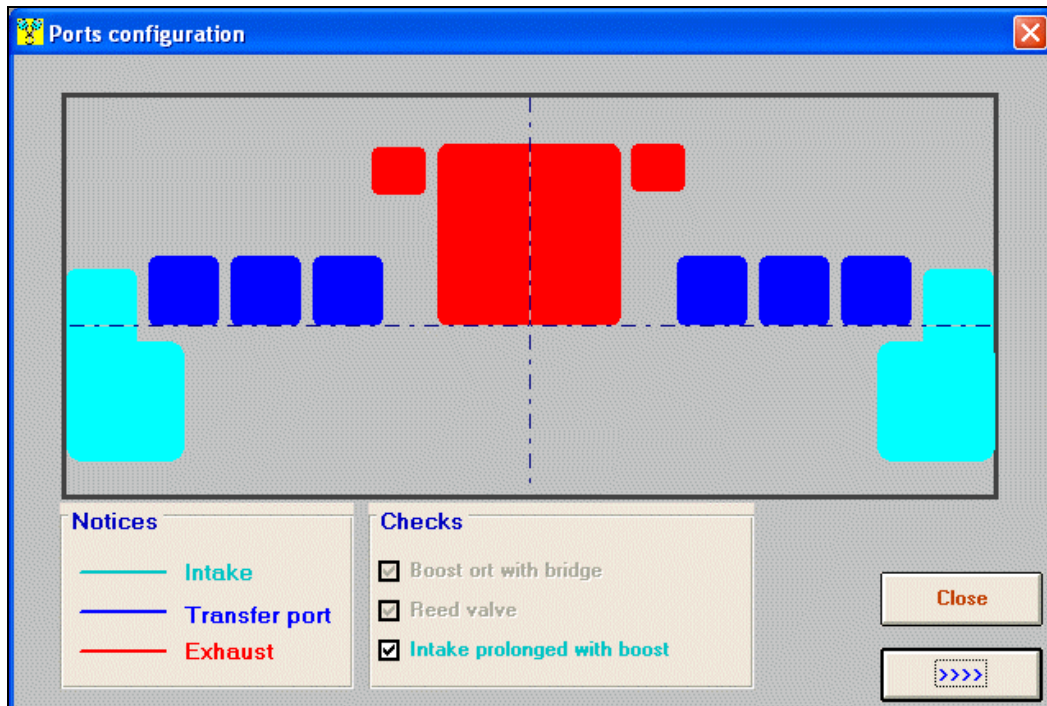
Close Resumptive data OK

Input data, OK to confirm... 16/01/2014 15.27

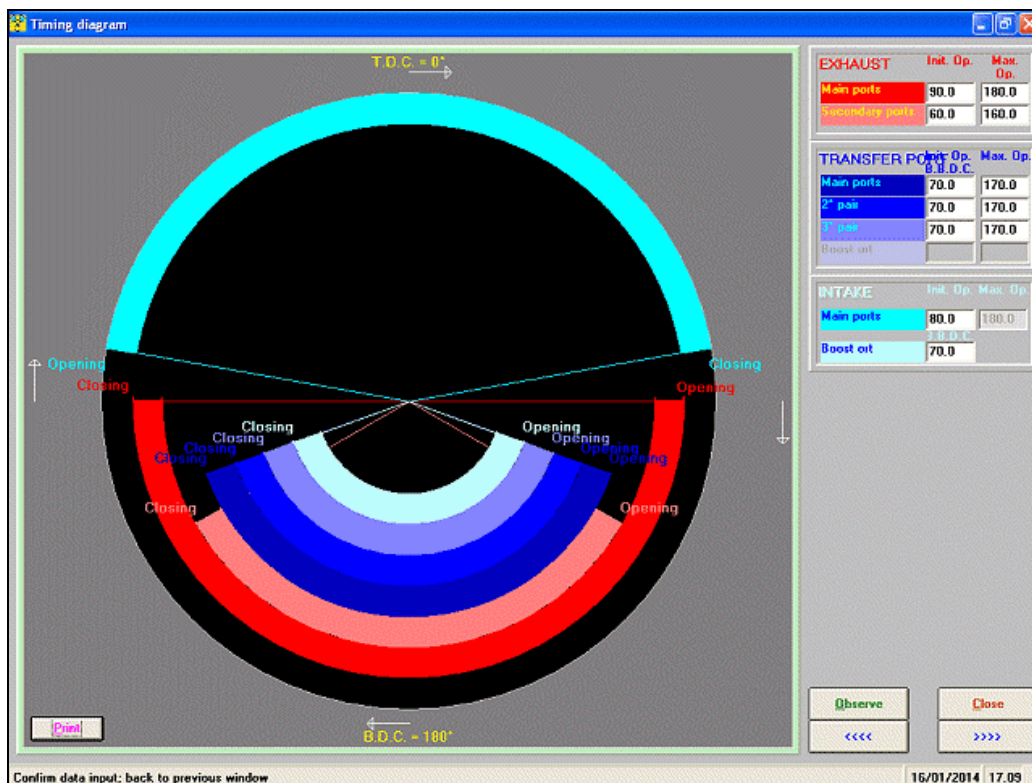
Exhaust lenght computing data input window

Ports areas computing

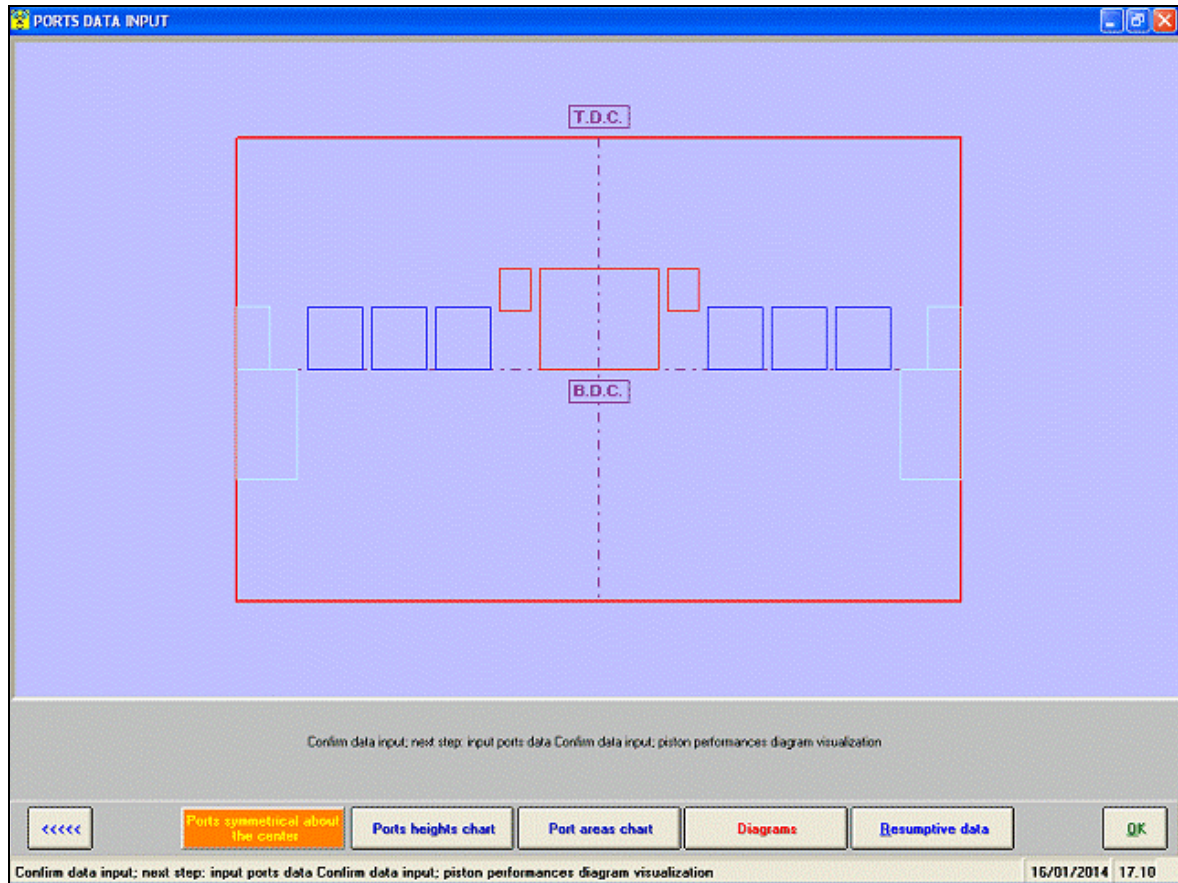
About port areas, this module is very usable. Firstly, it's possible to enable / disable the port by clicking the corresponding shape in the port areas configuration window, adding secondary transfert port, boost, bridges etc... Later, it's possible to input the timing (the ports phases and durations), and finally each port can be directly planned giving its own shape. This shape can be a regular figure (rectangle, circle, ellipse, trapetium) or not. In this second case, it's possible to design any kind of shape by placing control point in a milimetric background, or by modifying an elliptical figure.



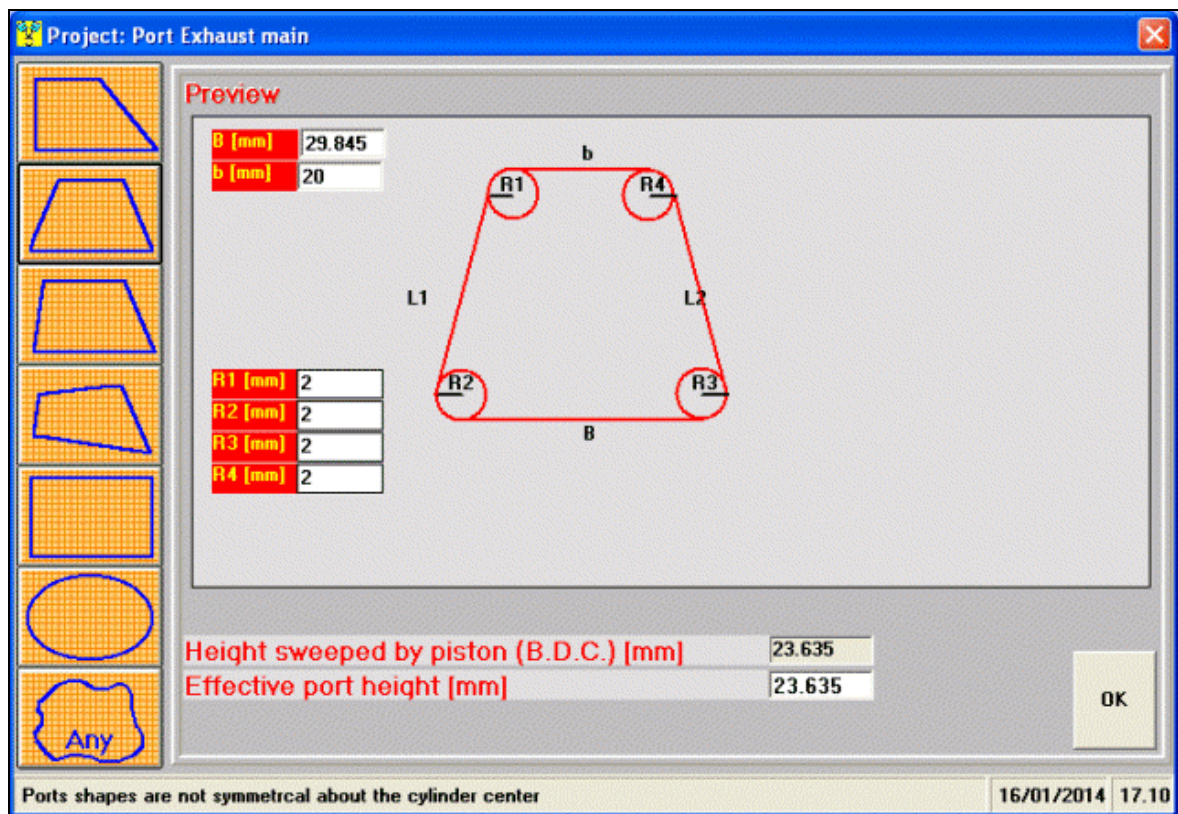
The cylinder ports selection



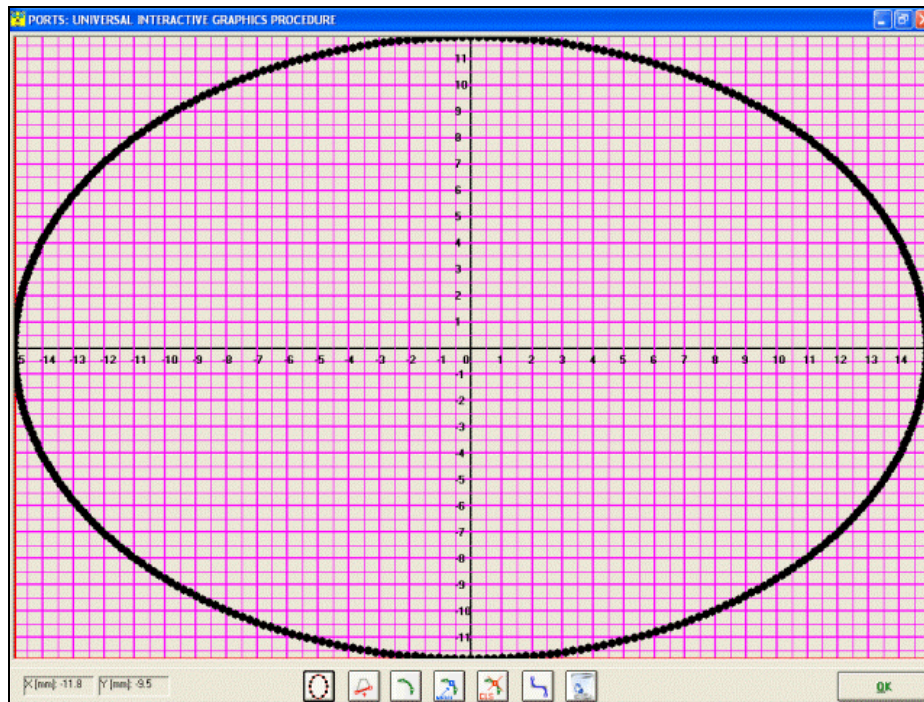
Insert the timing parameters directly



Click each area to plan the corresponding port



Port area with a regular shape



*Port area with any kind of shape (modify the elliptical shape
It is possible also to draw any shape)*

Results

2TTOOL gives several results, shown by printable diagrams and charts. There is also a special chart, "**Resumptive data**" showing the main parameters values.

The main quantities computed by the software are:

Crankshaft - kinematics:

Diagrams and charts of:

- ☛ Piston **Displacement**, **Velocity**, **Acceleration** (1st order and 2nd order components);
- ☛ **Volume** swept by piston (its peak value is the cylinder cubic capacity).



Crankshaft (kinematic) - piston Displacement diagram

Crankshaft - dynamics:

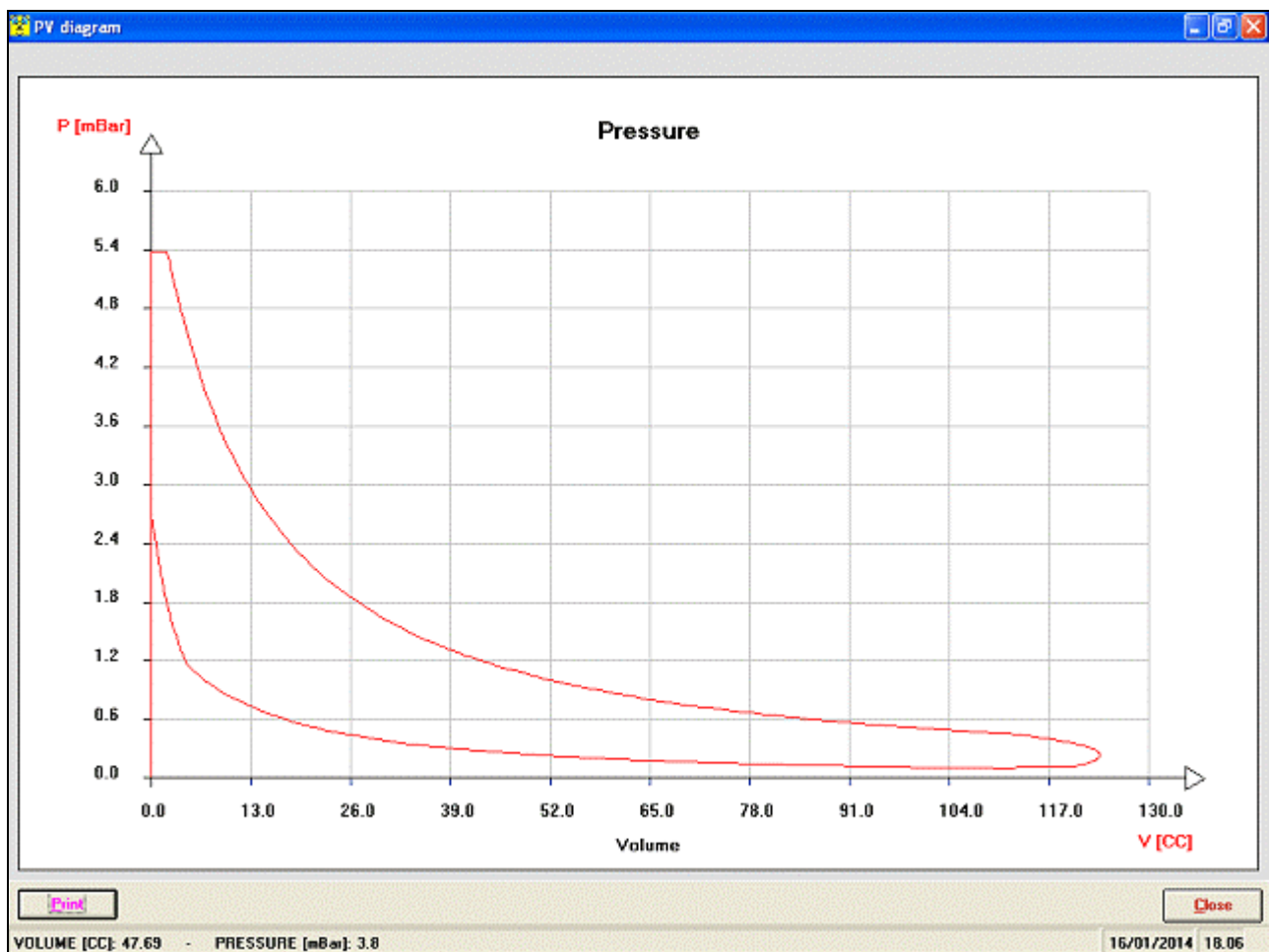
Diagrams and charts of:

- ☛ **Inertial forces** (I order and II order components);
- ☛ **Inertia Sigma** (stress of inertial part of force in the piston)

Crankshaft - thermo-dynamics cycle:

Diagrams and charts of:

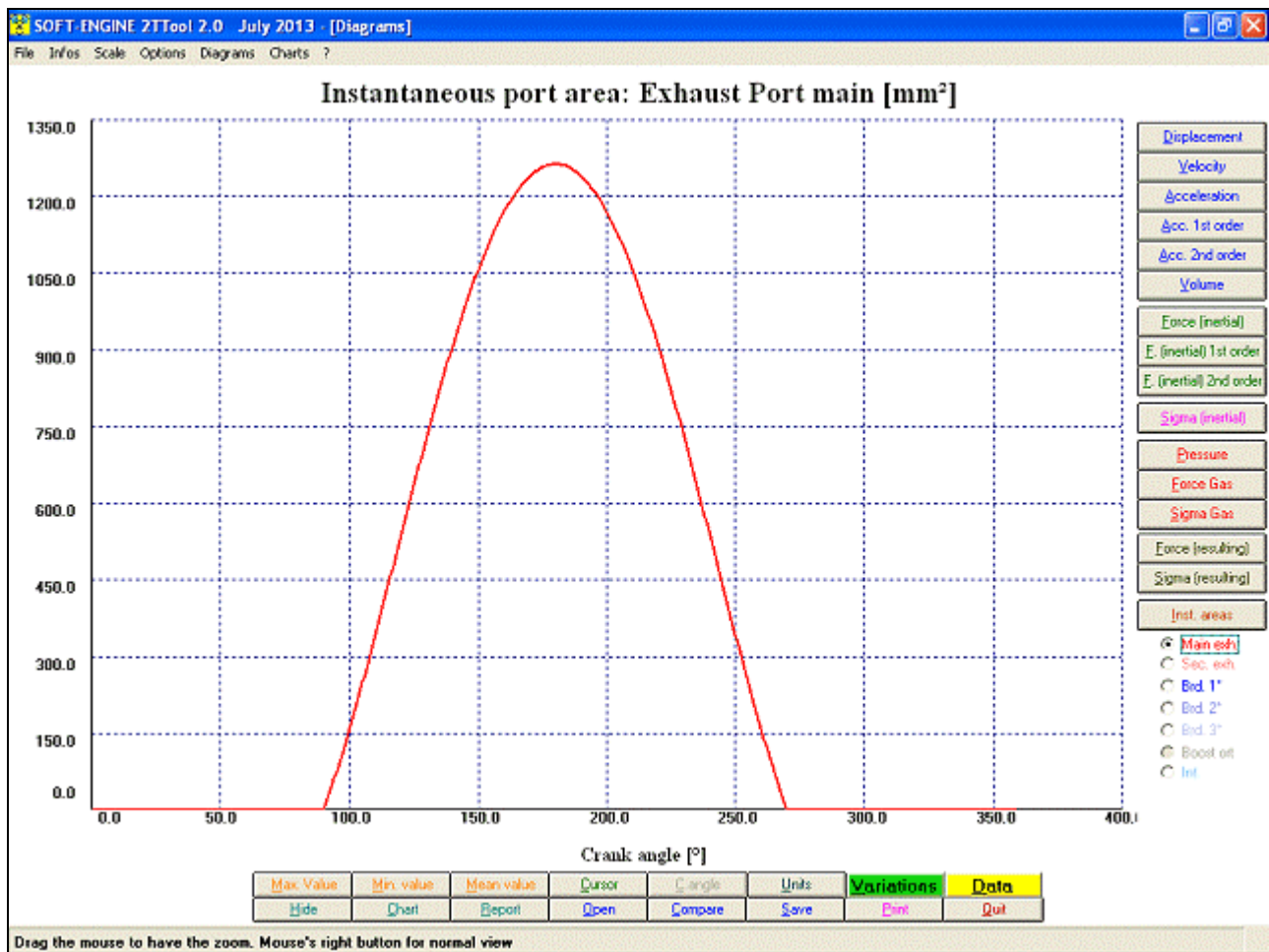
- ☛ **Pressure** in the cylinder; Pressure / Volume diagram;
- ☛ **Gas force**;
- ☛ **Gas sigma** (stress of gas part of force in the piston);
- ☛ **Resulting force** (inertia + gas);
- ☛ **Resulting sigma** (inertia + gas).



Crankshaft (thermo-dynamics cycle) - Pressure / Volume diagram

Port areas:

- ☛ **Port areas** (diagrams and chart);
- ☛ **Port heights** (charts);
- ☛ **Max. Area, Average Area, Angle-Area, Specific Angle-area, Time-area, Specific Time-area** (numeric values in the "Resumptive charts");
- ☛ **Blowdown range** (numeric values in the "Resumptive charts").



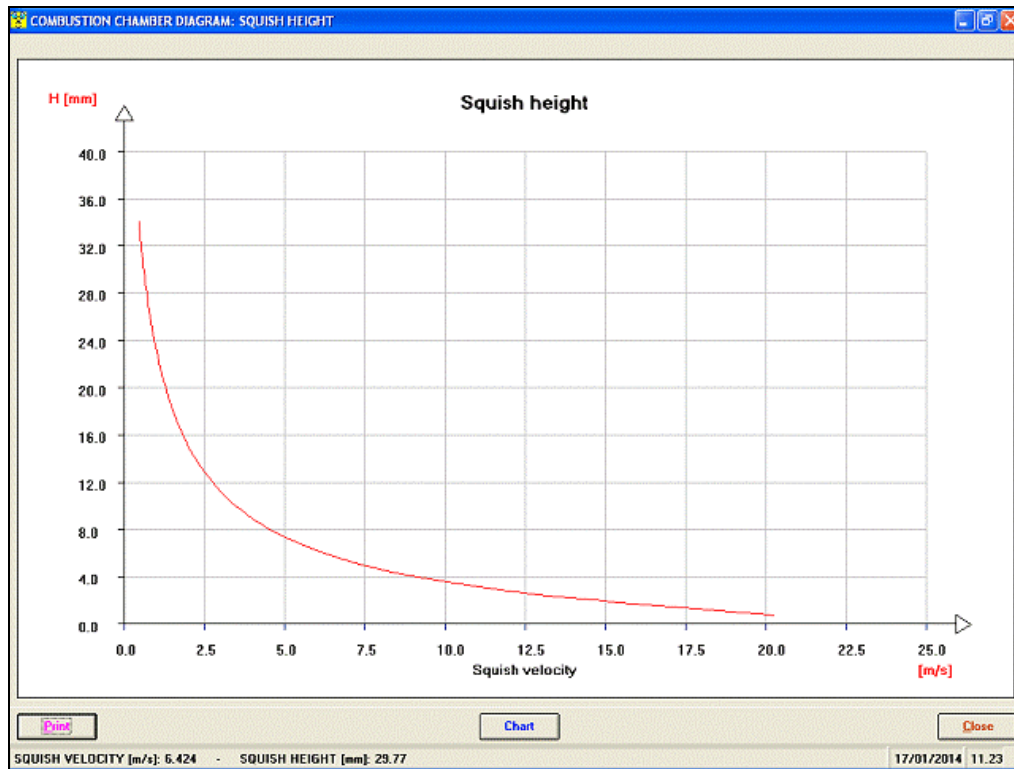
Port areas - main exhaust port area

Reed valve:

- ☞ **Reed valve vibration frequency**, 1st and 2nd order (numeric values in the "Resumptive charts");
- ☞ **Reed valve area** (numeric values in the "Resumptive charts").

Combustion chamber planning:

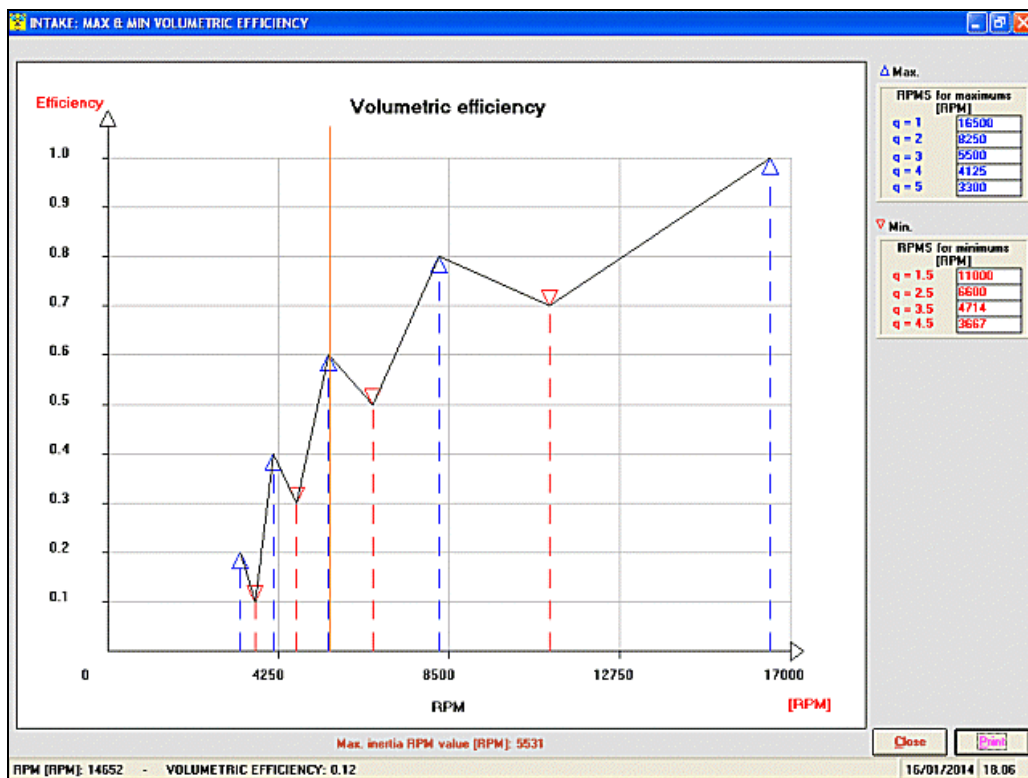
- ☞ **Squish height / Squish velocity** (diagrams and chart);
- ☞ **Effective compression ratio** (numeric values in the "Resumptive charts").
- ☞ **Geometric compression ratio** (numeric values in the "Resumptive charts");
- ☞ **Trapped volume** (numeric values in the "Resumptive charts");
- ☞ **Exhaust chamber volume** (numeric values in the "Resumptive charts").



Combustion chamber planning - Squish height / Squish velocity diagram

Intake formulas:

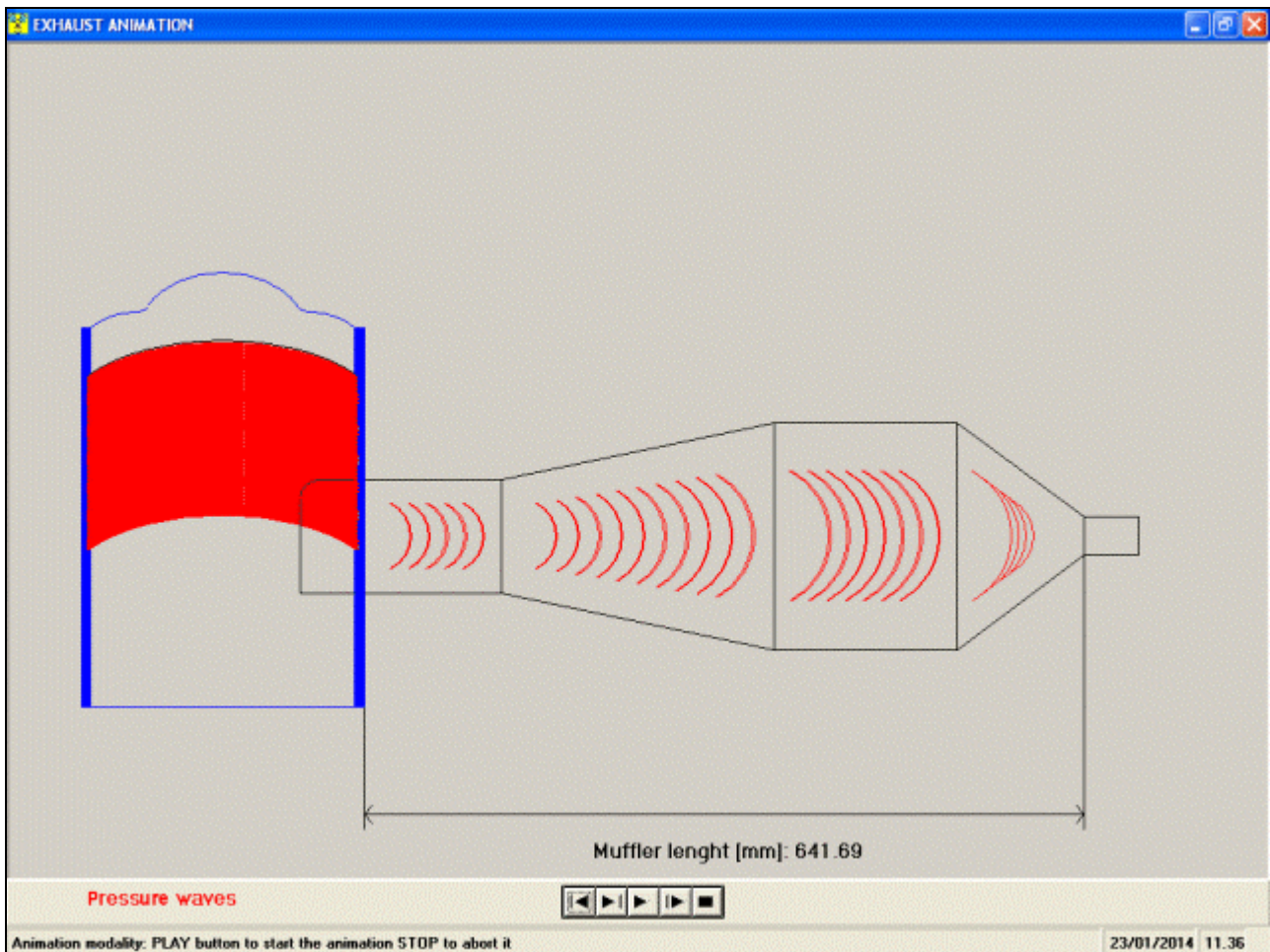
- ☛ **Volumetric efficiency / Resonances RPM** (diagrams and chart);
- ☛ **Max. resonance RPM;**
- ☛ **Minimums and Maximums resonance RPM.**



Intake formulas - Volumetric efficiency diagram

Exhaust formulas:

- ☞ **Exhaust lenght.** It is computed by only the gas temperature, max. RPM and exhaust period.;
- ☞ This value is shown in an animation showing also the **pressure** and **rarefaction waves**.



Exhaust formulas - animation showing the optimal muffler lenght

Conic and cylinder parts development:

This function is a link to the "[CONS](#)" by **SOFT-ENGINE**. If "Cons" software is present in the PC, that software is run by this link to develop conics and cylindrics parts for exhaust system.

Diagrams, charts and other features

For each CRANKSHAFT and AREAS FACTORS computed quantity (the most important) the following options are available:

- ☞ **Max.**, **min.** and **mean** value; **cursor** to read all curve points;
- ☞ **Zoom**, graph scale management;
- ☞ Sizeable graphics window with **complete colors management**;
- ☞ **Comparison** of different "2TTOOL" projects (max 6 projects);
- ☞ File section: it is possible to create directories to classify projects in a single session;
- ☞ Long filename management;
- ☞ Different projects **compared charts**;
- ☞ **Printing page setup**, with remarks, logo and graphics management;
- ☞ Chart of all quantities.

Soft-Engine engine simulation software – software “2TTool”

Versions and costs

| Version | Cost |
|------------|----------|
| 2TTool 2.0 | € 110.00 |

PC mininum configuration

| Feature | Description |
|--|---|
| Processor: | Any personal computer IBM compatible. |
| System: | Windows ME, NT, Xp, Vista, Seven, Eight, Ten - 32 or 64 bit systems. |
| Memory RAM and Hard Disk: | At least 512 MB RAM and 2 GB free in the hard disk (for best Windows performances). |
| CDrom or Dvdrom device: | Speed at least 52X. |
| Graphic card: | VGA, SVGA and compatible cards, set at least 32 bit, Min. resolution: 1024x768. |
| Miscellaneous: | Keyboard, mouse, at least 1 USB port free (to connect the printer). |
| Printer: | Any ink-jet printer. Total compatibility with laser printers. |
| Total compatibility with notebooks and cases minitower PC. | |